

confirmation of her views of the Christian cross being originally related to the swastika. The Chinese, taking this view, naturally called the Christians "Cross-worshippers." In Japan and India Mrs. Nuttall has found many parallels, and in Mesopotamia to this day the men of Saba appear to worship the Pole-star. The religious literature of ancient Babylonia and Assyria contains many passages which prove that the Semites who employed the cuneiform character held many views in common with the Mexicans; while an elaborate examination of Egyptian works has provided Mrs. Nuttall with a large number of proofs that in Mexico, China, and Egypt the views held in respect of certain astronomical phenomena were identical.

One of the most interesting sections of the book before us is that which treats of civilisations in general, and which contains Mrs. Nuttall's general summary and conclusions about the meaning of the facts which she has so diligently compiled. To detail these would greatly lengthen an article which is already inordinately long, and the reader will, no doubt, prefer to peruse these for himself; but we may briefly point out that the central idea of the work is that the swastika, which was first employed as a year sign, became later the symbol of the Four Quarters, of quadruplicate division, and of a stable central power, whose rule extended in four directions and controlled the entire Heaven. Human society was divided into four groups, and territorial organisations were formed in four parts. Early civilisations were founded on astronomical principles, on which also rested the worship of the gods. In the case of America, certain elements of culture are assumed to be due to "Mediterranean seafarers" and to transported refugees and would-be colonists; the basis, however, of both foreign and native civilisations was the recognition of immutable laws governing the universe, "attained, by both races, by long-continued observation of Polaris and the 'northern' constellations." The use of Mrs. Nuttall's volume is much facilitated by the excellent index, which fills thirty-four pages of matter printed in double columns in small type, and which merits great praise. We could have wished that a bibliography had been added and more references to the public literature of early symbolism; to say this is not to detract from the commendation which the book justly deserves, for a classified list of authorities could be compiled from Mrs. Nuttall's notes, and it would be useful to everybody interested in the subject.

GEOMETRY—NOT IN EUCLID'S ORDER.

Primer of Geometry, comprising the Subject-Matter of Euclid I.-IV., treated by the Methods of Pure Geometry. By H. W. Croome Smith, B.A. Pp. xvi + 100. (London: Macmillan and Co., Ltd., 1901.) Price 2s.

THIS little book is another attack on Euclid, and its main object is to exhibit an elementary course of geometry in a system of natural sequence—Euclid's order and method being, of course, ignored. Although in the preface the author adopts a severely logical style and successfully maintains a strong case against our conservative Euclidians, it seems to us that in one respect he is in error. His work is divided into three NO. 1682, VOL. 65]

chapters, headed "Straight Lines and Rectilineal Figures," "The Circle," and "Areas." In the first chapter no mention of a circle occurs, and the author taxes Euclid with an illogical mode of procedure in the following words:—

"It is at least questionable logic to make use of the circle in the early stages, and subsequently to use the properties thus demonstrated of lines, angles, &c., in demonstrating the properties of the circle."

Justice to Euclid compels us to maintain that this charge is substantially unjust, because the only use made by him of the circle in the early stages (Book I. of Euclid) relies on the facts that the radius is a line of constant length, and (in prop. xii. of Book I.) that if a circle cuts a right line once, it will cut it again. No one can quarrel justly with these assumptions, or can seriously describe them as involving "properties" of the circle which require antecedent demonstration. When criticising Euclid, we must remember that geometry is not wholly a system of pure or formal logic—it implies the sense of sight, sensuous intuition in space.

One disadvantage of ignoring the circle wholly in the early stages, as is done by Mr. Croome Smith, is that we get into serious difficulties with regard to the conception and measurement of *angles*. He identifies an angle with "change in direction"—"this *change in direction*, which has nothing to do with the length of the line, is what we mean by *angular magnitude*" (p. 6); "the angle is *measured* by the amount of revolution of a straight line when turned about the vertex in the plane of the lines from the one to the other." True; but how are we to get a quantitative meaning of the word "revolution" itself? It is, without the aid of the conception of a divided circle, or of a system of superposition, just as vague and undefined as Euclid's own term "inclination." It appears to us that Mr. Croome Smith wrestles vainly with a definition of a right angle on p. 7. He imagines a right line OA to revolve round O into the position OB, which is OA reversed, and he says,

"in the position OC, midway between OA and OB in the course of its revolution, the turning line makes with OA or OB an angle which is half the preceding angle: such an angle therefore is also an angle of *constant* magnitude, and is called a right angle."

In this definition there is one little word—"midway"—the precise meaning of which we should wish to know. We fear that it is hopelessly vague without the notion of a circular protractor, or something more than the author is willing to give us. Hence we think that his definition of an angle and his method of measuring angular magnitude are not successful.

Nevertheless, criticism of this kind must not condemn a book which has several merits. A judicious teacher will always be able to supplement imperfect definitions. There is, perhaps, far too much straining after completeness of definition and verbal exactness in writers on geometry; for some of the most simple notions in the subject are things which cannot be defined with absolute accuracy, and the writer as well as the teacher must take it for granted that the pupil has already an adequate notion of the thing described—*e.g.*, a point, a right line, a plane surface.

Mr. Croome Smith rightly discards Euclid's limitation

that we must make no use of the bisector of an angle or of a line until we have shown how to draw the bisector. Fancy anyone laying down the law for Clerk Maxwell that he must make no investigation of the electromagnetic theory of light until he has demonstrated the reality of the ether! By ignoring the restriction, Mr. Croome Smith is enabled to replace the usual proof of the Asses' Bridge proposition by one much simpler.

All the *problems* of Euclid (to bisect an angle, to draw a perpendicular to a line from a point without it, to draw a tangent to a circle, &c.) are kept by themselves in a section at the end of the book. The author's proofs leave nothing to be desired on the score of simplicity, and his little book will be of much value to any committee that may be formed by the Universities or the British Association for the purpose of providing an easy and natural course of geometry for use in our schools.

We cannot refrain from calling the author's attention to the *form* of such a statement as (p. 31): "A rhombus, and therefore a square, are equilateral." This is followed by one of similar arrangement; and in line 12 from the end of p. viii, "is implied" should be "are implied."

OUR BOOK SHELF.

The Small Farm and its Management. By James Long. Pp. xvii + 281. (London: Smith, Elder and Co., 1901.) Price 6s.

MR. LONG starts with the idea that it is very desirable for the purpose of maintaining a vigorous rural population that the number of small farms cultivated by their owners should be considerably increased. Nearly everyone will probably agree to this proposition. When, however, we learn the conditions needed for the success of the small farmer, and which are plainly set forth by the skilful writer of the present book, we become more and more convinced that the extent to which successful farming of this kind can be developed under present conditions is very limited.

Mr. Long tells us that for a successful twenty-acre farm, third-class land must be refused at any price; that second-class land should only be occupied by highly skilled men with sufficient capital; and that first-class land should, if possible, always be selected for such a holding. The land must, further, be situated near a railway, with easy access to a large consuming population. Such land, Mr. Long frankly tells us, will generally be found already occupied, and could not be purchased save at a high price. His ideal farm is, further, to have one-half of its area in permanent grass, and to possess an acre of orchard. It must, of course, have a dwelling house and farm buildings, with a suitable access to a road. How can all these special conditions be provided except at a prohibitory cost?

When we pass to the details of the management which is to result in a handsome profit to the owner, we discover that he is supposed to be no mere agricultural labourer, but to excel both in knowledge and judgment the average farmers of the country. His farm of twenty acres is to carry one horse, four cows, a breeding flock of ten ewes, two sows and their offspring, eighty hens and forty turkeys, and is to produce for sale twenty-four quarters of oats, twelve tons of potatoes, and the fruit from an acre of orchard. His four cows are to be chosen and managed with such judgment and skill that they will yield 3000 gallons of milk every year, a quantity far above the average. His hens are to lay twice the number of eggs usual in poultry yards. Everything on the farm

is assumed to be first rate and thoroughly successful. The result of this splendid management is to be a profit of 120% per annum. Years of drought, or other agricultural disasters, are apparently not supposed to occur. It will naturally be asked, if a profit of 120% can be made on twenty acres, why should not an annual profit of 1200% be made on a farm of 200 acres worked on the same lines? And if such is the value of the land to the occupier, at what price can it be purchased?

Whatever opinions we may form as to the possibility of creating a system of small farms, or as to the prospects of their profitable cultivation, we can form but one opinion about Mr. Long's book. It is well done, and supplies a large amount of information on a great variety of subjects which cannot fail to be of value to all who are seeking to make a profit out of a small holding.

R. W.

L'Huitre Perlière, Nacre et Perles. Par L. G. Seurat. ("Encyclop. Scient. des Aide-Mémoire"). Pp. 194. (Paris: Masson et Cie.) Price 2 fr. 50 c.

THIS is a useful little book of close on 200 pages and a few illustrations, in which the author—whose name was already known in connection with pearl oysters—has brought together the leading facts in regard to the molluscs, of both sea and fresh waters, producing pearl and mother-of-pearl. The introduction shows that the book has been written mainly in the interests of the French nacre industries, which the author regards as of great national importance. Although London is at present the great market for pearl shell, we are told that "La France possède, en effet, les plus vastes bancs d'huîtres perlières et nacrières qui soient au Monde, dans ses colonies d'Océanie," and the author evidently desires to stimulate the exploitation and cultivation of the French pearl industries at Tahiti and other Pacific stations. But still, the descriptions of animals and fisheries have been drawn from all parts of the world, and, in fact, most attention is given to the oyster (*Melegrina fucata*) of Ceylon and British India on the well-known banks of the Gulf of Manaar.

M. Seurat points out on more than one page the gaps in our knowledge of the nacre-forming molluscs, and wisely insists upon the necessity of a thorough examination of the structure, life-history and habits of the *Melegrinas* before it is possible to establish a rational regulation of the fisheries. The scope of the work may be gauged by the following summary of the contents of the chapters: Anatomy and biology of the pearl oyster and of other molluscs that produce pearls or nacre; the pearls, their position, structure, chemical composition and experiments as to their production artificially; the fisheries both in the sea and also in the rivers of Europe and America; commerce and industries; and, finally, pearl-oyster cultivation. In his conclusion our author sums up that "l'ostréiculture perlière est une chose possible, qui est susceptible de donner des résultats pratiques," and draws a rosy picture of the prosperity that would attend the lagoons of Tahiti under a rational exploitation of this new industry. So may it be.

Voices of Nature and Lessons from Science. By Caroline A. Martineau. Pp. 160. (London: Sunday School Association, 1901.) Price 1s. net.

MISS MARTINEAU describes clearly a number of simple scientific facts, mainly concerning natural history subjects. She thus assists the extension of a knowledge of nature among those who are greatly in need of it. The prominence given to Darwin's teachings—a large part of the book being taken up with the elementary principles of evolution—is a very commendable characteristic. The spiritual lessons to be learnt from natural phenomena may be "skipped" by readers who prefer to deal with ethics apart from natural science.